Compiled by Kathy Wythe

Understanding what lies beneath

Groundwater critical to Texas water

Groundwater is a critical element in the mix for supplying the state and nation with enough water. A major source of water in Texas, used for domestic, municipal, industrial and agricultural purposes, groundwater makes up almost 60 percent of the approximately 17 million acre-feet of water used annually. About 80 percent is used for irrigating crops.

Many individuals and organizations are involved in understanding and protecting groundwater. Scientists are researching the quality and quantity of groundwater while the Texas Legislature is enacting laws to protect groundwater and state agencies are accumulating data about groundwater. The Texas Water Development Board (TWDB) and Texas Commission on Environmental Quality (TCEQ) work together on many of the groundwater issues.

Glossary

The following glossary defines terms associated with groundwater and gives an overview of organizations and programs associated with groundwater in Texas:

Aquifers: *Geological formations that can store, transmit, and yield groundwater to a well or spring.* Groundwater comes from nine major and 21 minor aquifers in Texas.

Confined aquifer: *Layer of water that is held between two layers of clay.* The recharge area is limited to land surface where the aquifer's geologic material is exposed to the land surface.

Unconfined aquifer: *Layer of water that has a confining layer on bottom and a layer of permeable soil and geologic strata above it.* The recharge area is all of the land area above the unconfined aquifer.

Groundwater Rights: *Access to groundwater is a property right of the landowner.* This allows a landowner the right to capture the water beneath his or her property, and sell, lease, and move the water pumped from his or her property to a neighbor, corporation, or city. Texas courts have limited the rule of capture in order to prohibit a landowner from:

San Marcos River Waterfall. Photo by Earl Nottingham, © Texas Parks and Wildlife Department

- pumping water for the purpose of maliciously harming an adjoining neighbor,
- pumping water for a wasteful purpose,
- causing land subsidence (sinking) on adjoining land from negligent pumping, and
- drilling a slant well that crosses the adjoining property line.

Texas legislators have passed several laws that curtail groundwater pumping. Three major restrictions to prevent unlimited pumping of groundwater govern:

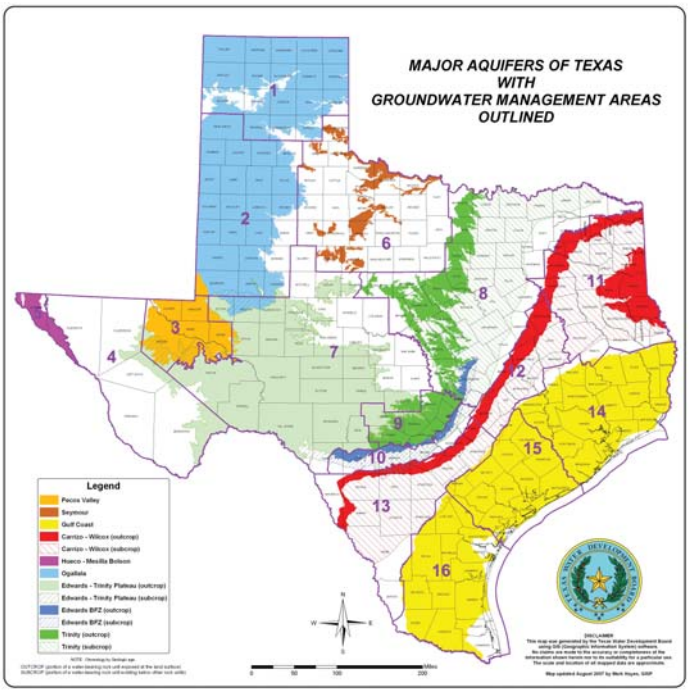
- pumping water that comes from the underflow of a river,
- pumping groundwater without a permit from an aquifer within the jurisdiction of a groundwater conservation district (GCD), and
- pumping groundwater from the Edwards Aquifer within the jurisdiction of the Edwards Aquifer Authority without authority.

Groundwater Conservation District (GCD): *A local unit of government authorized by the Texas Legislature and ratified at the local level to manage and protect groundwater.* There currently are 95 groundwater conservation districts in Texas. Texas law authorizes GCDs to modify the rule of capture by regulating groundwater production through permitting of non-exempt water wells, well spacing requirements, and through other rules as deemed necessary to conserve, preserve, protect, recharge, prevent waste of groundwater, and control subsidence.

Groundwater Management Area (GMA): *An area delineated and designated by TWDB for joint planning and managing groundwater resources.* Each area is comprised of individual groundwater conservation districts. The decisions for current GMAs include groundwater availability using data collected from regional member districts and defining the quantity of allowed groundwater production.

Priority Groundwater Management Area (PGMA): *An area designated and delineated by TCEQ that is experiencing, or is expected to experience, critical groundwater problems within 25 years.* They include shortages of surface water or groundwater, land subsidence resulting from groundwater withdrawal, and contamination of groundwater supplies. The Legislature authorized TCEQ, TWDB, and the Texas Parks and Wildlife Department (TPWD) to study, identify, and delineate PGMAs and to initiate the creation of GCDs within those areas.

Groundwater Availability Modeling (GAM): (http://www.twdb.state.tx.us/gam/) *The process of developing and using computer programs to estimate future trends in the amount of groundwater available in an aquifer and which is based on hydrogeologic principles, actual aquifer measurements, and stakeholder guidance.* TWDB has responsibility for the GAM program. It and its consultants have modeled the major aquifers and currently are modeling the minor aquifers. These models will be important tools for GCDs and Regional Water Planning Groups to evaluate water-management strategies and to assess present and future groundwater availability trends under normal and drought conditions.



Well Information/Groundwater Quality Data: (http://www.twdb.state.tx.us/GwRD/waterwell/well_info.asp) *A database that contains well information, including location, depth, well type, owner, driller, construction and completion data, aquifer, water level, and water quality data.* Of the 1,000,000 plus water wells drilled in Texas over the past 100 years, more than 130,000 have been inventoried and the data entered into the TWDB groundwater database. Access to TWDB's Groundwater Database (and other databases) through an ArcIMS mapping and data display service is available at http://wiid.twdb.state.tx.us/.

Texas Groundwater Protection Committee (TGPC): (http://www.tgpc.state.tx.us/Default.htm) *An interagency committee that develops a comprehensive groundwater protection strategy which coordinates the activities of all the participating agencies and documents what needs to be done to protect groundwater in Texas.* The strategy includes guidelines for prevention of

contamination, conservation of groundwater, and coordination of groundwater protection activities of the agencies and entities represented on the TGPC. Recent reports of the TGPC include the following:

- Joint Groundwater Monitoring and Contamination Report – 2007
- 2008 State of Texas Water Quality Inventory Groundwater Assessment

Texas Alliance of Groundwater Districts: (http://www.texasgroundwater.org/) *Educates the public, furthers groundwater conservation and protection activities, and provides for the exchange of information between individual districts as well as with the public.*

TWDB's Groundwater Resources Division: (http://www.twdb.state.tx.us/GwRD/pages/gwrdindex.html) *Responsible for all aspects of groundwater studies in the state.* This group monitors water levels and quality in the state's aquifers, conducts regional-scale aquifer modeling, and houses and maintains water well records. It approves groundwater districts' management plans, and provides groundwater information to citizens and lawmakers of the state.

TCEQ's Groundwater Planning and Assessment: (http://www.tceq.state.tx.us/permitting/water_supply/groundwater/gw_index.html)

U.S. Geological Survey (USGS) National Water-Quality Assessment Program: (http://water.usgs.gov/nawqa) *Supports national, regional, and local information needs and decisions related to water-quality management and policy.* Part of the program is focused on regional assessments of groundwater status and trends in principal aquifers, including the Ogallala Aquifer, the Edwards-Trinity Aquifer, and the Texas coastal uplands and lowlands aquifer systems. The USGS implemented the National Water-Quality Assessment (NAWQA) Program in 1991. More information can be obtained at http://water.usgs.gov/nawqa/studies/praq/.

Other USGS groundwater Web sites include:

Ground-Water Data for Texas: (http://waterdata.usgs.gov/tx/nwis/gw)

Ground-Water Availability in the United States: (http://pubs.usgs.gov/circ/1323/pdf/Circular1323_book_508.pdf) *Examines what is known about the nation's groundwater availability.* This report outlines a program of study by the USGS Ground-Water Resources Program to improve our understanding of groundwater availability in major aquifers.

Photo by Danielle Supercinski, TWRI